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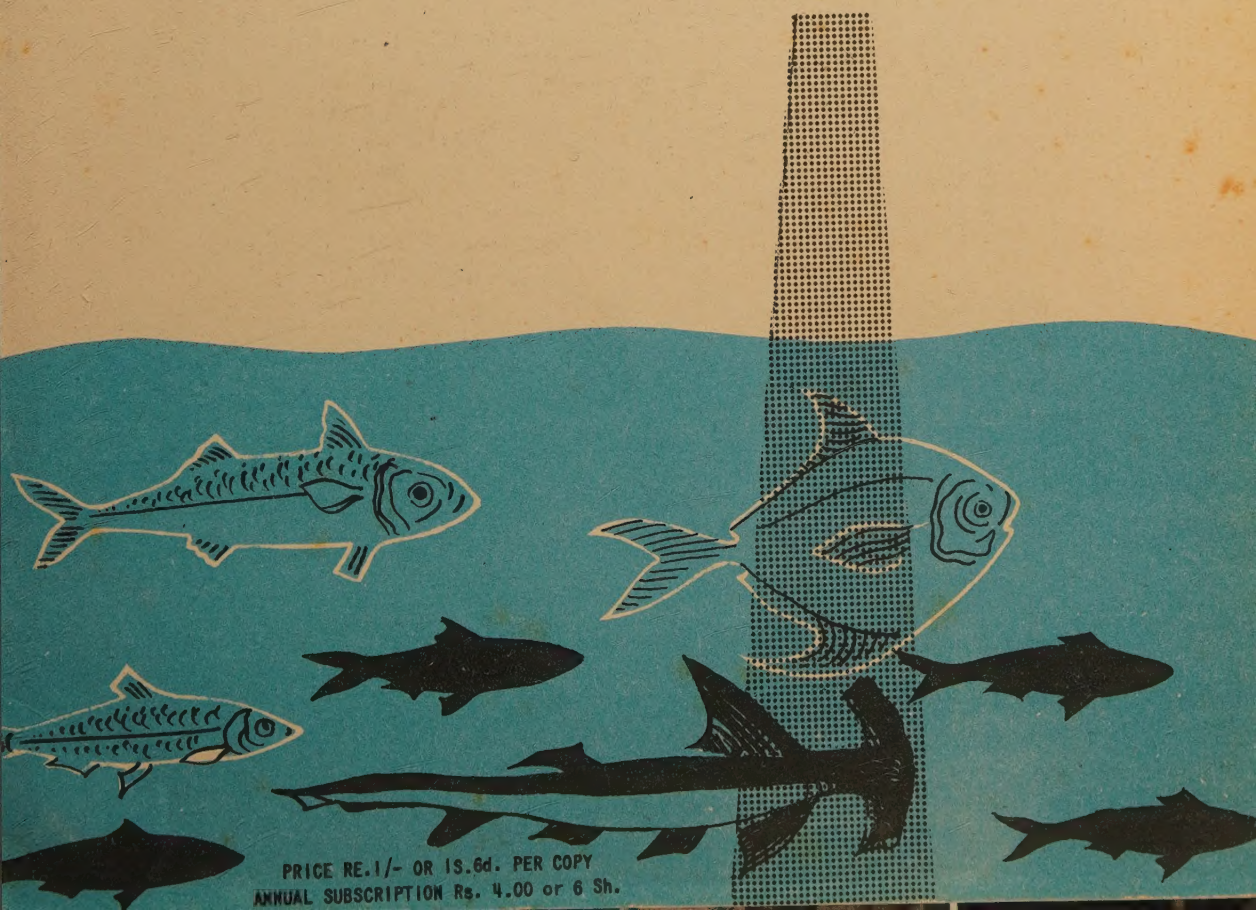
INDIAN FISHERIES BULLETIN



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INDIAN FISHERIES BULLETIN

Volume VIII, No. 1

January, 1961

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INDIAN

GENERAL AND DEVELOPMENT

Status of Fishing Industry in India 1959-60

Fisheries development programmes in India have been considerably expanded during the last two years. Though fish production in 1959 was affected to some extent by the scarcity of oil sardine and mackeral, these two fisheries are occurring in large quantities this season and it is expected that the target of production of 1.4 million tons proposed to be achieved by the end of the Second Five Year Plan period would be reached.

Inland Fisheries.

About 1.4 million acres of Inland waters have been stocked with about 180 crores of fry and fingerlings. The estimated production of inland fish was about 2.75 lakh tons. The State Fisheries Departments have given high priority to the production of quality fish fry for stocking ponds, tanks and reservoirs. Additional centres of fish-seed production were also established. Special emphasis has been given to the production of fish fry by induced breeding methods by pituitory hormone injections. Experimental breeding of common carps has also led to increased use of this variety for stocking inland waters.

With the increasing activity in the development of river valley projects, special emphasis has also been laid on the necessity for stocking these waters, proper management and effective exploitation. The recommendation made earlier by the Indo-Pacific Fisheries Council regarding the River basin development has been adopted by the States of Orissa, Bombay, Kerala, Bihar, Madras, Punjab and the Control Boards of Tungabhadra, Hirakud, Koyna and Nagarjunasagar. Improved methods of fishing are being developed in the reservoirs of some of the States with the assistance of an F.A.O. expert obtained from Russia

The Central Inland Fisheries Research Station continues its studies on population dynamics, soil composition in fish ponds, introduction of new varieties of fish, weed control, water pollution studies and the Hilsa fisheries. Based on the investigation conducted at this Station, it has been considered that Tilapis is not a desirable fish for extensive culture in India. But studies on common carp and Grass carp have yielded promising results. A survey of the fisheries of the larger reservoirs and lakes has been initiated on a systematic basis with the help of an F.A.O. Expert. His services have also been utilised for training candidates from the State Governments and Extension Units in the proper use of improved types of fishing gear in deep waters.

At present there are 10 Central Fisheries Extension Units functioning in various States. The programme has been reorientated, laying greater emphasis on the training of Village Level Workers and field staff of State Departments and in Community Development and National Extension Blocks

Marine Fisheries.

The programme of mechanisation of fishing craft has been intensified by developing new designs of fishing craft in most of the coastal areas. At present there are over 1600 mechanised fishing vessels in the country. With the increasing demand for the raw material by the processing factories, these fac-

tories themselves are now taking measures to construct suitable mechanised fishing boats. Marine diesel engines are supplied to fishermen at subsidised rates. Facilities have been extended for the import of engines for the benefit of the fishing industry, especially to Cooperatives and groups of fishermen.

The Fisheries Enquiry Committee set up by the Government of India for enquiring into, reviewing and assessing the difficulties of fishing industry in relation to the existing rules and regulations applicable to motorised fishing vessels, studied the various aspects and made certain recommendations for improvement of mechanised fishing crafts and also for providing adequate facilities for this programme.

Use of winches, gurdies and line hauler is becoming popular with the fishermen, in view of the benefits of operating a large number of units of gear the Government have set apart some funds for the import of fishing equipment like synthetic twine, hemp twine, hooks, etc.

With the assistance of F.A.O. Experts, a survey was conducted in some of the States with a view to develop fishing harbours in important centres. Some of the surveys relating to the centre in Gujerat, Maharashtra, Mysore, Kerala and Madras have been completed. Construction work has already been taken up in some of these centres.

The four Government of India off-shore fishing stations continue their surveys for charting fishing grounds and introducing improved methods of fishing gear. Useful information has been obtained with regard to potentially rich fishing grounds off the coasts of Gujerat, Mysore, Kerala, Madras, Andhra Pradesh and Orissa These investigations will be continued. Private industry has already been attracted to organise fishing companies and fish processing factories on commercial lines.

The Central Fisheries Technological Research Station is engaged in investigations in developing new designs of fishing craft, improved types of fishing gear, use of new materials, preservation of fishing materials and on beach boat trials. Two F.A.O. Experts are assisting the Station in the organisation of research programmes. The investigations on the beach-boat trials are of particular interest to some of the under-developed countries in the region. This report deals with hull shape and construction, handling of the boats in the sea and on the beach, engine type, engine power, engine installation, propellers, shafts and pumps.

The Central Marine Fisheries Research Station continued its studies on the commercially important fishes. Work relating to the data collected by the off-shore fishing vessels and on population dynamics received special attention.

Fishery Technology.

With the increasing landings of fish and the need for proper utilisation, the State Governments are establishing additional ice and cold storage plants and are promoting improved methods of fish curing, transportation and marketing. Fishing companies are also engaged in freezing and canning of some of the important varieties of fishes, both for internal and external markets.

The Central Fisheries Technological Research Station has taken up problems relating to improved methods of curing, freezing and canning and also investigations relating to improvement in the quality of the product.

Marketing.

Fish marketing, though developed to some extent in the coastal areas and within limited regions, there is definitely a need for proper development of marketing in the inland States and hinterland. Three F.A.O. Fish Marketing Specialists undertook surveys in certain regions and made certain recommendations regarding the development of fish trade. It is necessary to conduct market surveys, study local marketing programmes, initiate integrated scheme for survey and introduce pilot marketing schemes for establishing regular trade channels.

In order to enable the fishermen—the primary producer to get better returns, adequate attention is being paid to the development of producers cooperative societies and marketing federations. The possibility of introducing regulated markets is also being examined. The Ministry of Food and Agriculture have recently arranged to operate six refrigerated rail vans in three routes.

Training.

The Government of India are establishing a higher training institute for Fisheries Officers at District level, with the assistance of U.N. Special Development Fund. The existing course in Inland Fisheries continues to give training to candidates sponsored by the State Governments and some of the neighbouring countries.

Training to candidates for skipper's and Mate's tickets is being given on the fishing vessels belonging to the off-shore Fishing Stations. In addition to the two six months courses in fishing boat designs and construction, an advanced course of three months was conducted in fishing craft designs; these candidates are now employed in the maritime States. The Central Fisheries Technological Research Station is now providing a training course for carpenters for understanding the designs and follow the lines of construction. Training was also given to nominees from States in the designs, fabrication and operation of shrimp trawls from small power boats.

Foreign Assistance.

The Central and State Governments continue to take advantage of the offer of technical and commodity assistance from F.A.O., Colombo Plan, Indo-Norwegian Project and T.C.M. with regard to power fishing, improved methods of fishing gear, development of fishing harbour, storage, marketing and transportation, fishery surveys, organisation of fishery technological researches and training of personnel required for management of fisheries.

The Government of India, considering the importance of fisheries, have considerably increased the financial provision for fishery schemes in the Third Five Year Plan.

(ii) Proceedings of the Eighth meeting of the Central Fisheries Research Committee held on the 13th and 14th December, 1960 at Puri

The eighth meeting of the Fisheries Research Committee was convened by the Ministry of Food and Agriculture on the 13th and 14th December, 1960 at Puri, at which the following agenda items were discussed and resolutions adopted.

1. *Progress made in Fish Breeding Experiments*:—

While the work aimed at improving the breeding and hatching techniques should be continued as hitherto, intensive work of a more fundamental nature should be carried out on the following:—

(a) The hormone potency of glands from fishes of various sizes and maturity stages;

(b) Correct stages of maturity of the breeders (to be selected for breeding);

(c) Critical study of the environmental factors favouring proper maturation of glands;

(d) Possibilities of utilizing pituitary material from sources other than fresh water fishes.

A course of training on induced breeding be organised for imparting intensive training to nominees of State Fisheries Departments and Fisheries Extension Officers.

2. *Investigations on Weed Control in Fish Ponds*:

(a) The existing programme for aquatic weed control undertaken by the Central Fisheries Research Station be continued and greater emphasis be given in evolving suitable mechanical methods for such waters where chemical methods may not be applicable.

(b) Careful studies be made on the toxic hazard of each type of chemicals tried for the purpose before propagating the same for public use.

(c) The scope of autecological studies on hand be enlarged to include nutritional requirements of selected noxious weeds and possibilities of controlling their growth and propagation by changes in environmental conditions.

(d) Possibilities of biological control of weeds by using species of herbivorous fishes like Grass Carp, Gourami etc. be vigorously pursued.

3. *Further observations on the introduction of Common Carp and Tilapia*:

(a) The present investigations on *Cyprinus carpio* should be continued and work on exploitation of the fish from tanks should be pursued.

(b) Tilapia should not be introduced in areas other than those where it has already been permitted.

(c) Work on culture of *Tilapia* as recommended at the Sixth meeting of the Fisheries Research Committee should continue.

4. *Establishment of Cooperation between Zoological Survey of India and the various Fisheries Departments and the Central Institutions*:

The Committee is glad to note the offer of the Zoological Survey of India to undertake systematic work on different groups of animals obtained in connection with fisheries work. It is, therefore, recommended that the Central and State Fisheries Departments and the Universities may provide necessary facilities to the Zoological Survey of India to obtain material collected by different ships or through other sources for identification and study. The identified duplicate specimens will be sent to the respective departments.

5. *Proposals of Research schemes of Central Marine Fisheries Research Station, Mandapam and Central Inland Fisheries Research Station, Barrackpore, for the Third Five Year Plan* :

The Chief Research Officers will reorganise the proposals of the research schemes for the Research Stations presented for the Third Plan in the light of the discussions at the Research Committee meeting.

MARINE.

(i) **Mackeral Fishery**

The mackeral fishery was good all along the West Coast during the quarter ending December, 1960 in contrast to the corresponding period of 1959. At Karwar the fishery commenced comparatively early and was reported to have broken all previous quarterly records in the total number of fishing days, number of 'rampan' hauls and in the total catch (2595.8 m. tons). In the Mangalore zone the fishery was a success and over 33 m. tons of mackeral was landed at Ullal. At Calicut the mackeral fishery showed very good improvement over last year, the total catch of the quarter being 683 m. tons as against 356 m. tons in 1959. At Cannanore a total of over 151 m. tons was estimated to have landed in the quarter. At Ernakulam that fishery was fairly good and at Vizhingam largest catch (3107 Kg) was in October, the quarterly total being 5777 Kg.

The 'rampan' was the main net used for mackeral at Karwar while the cast net, the *Pattabale* and the *Kanthabale* were the main gears used at Ullal. *Ailakollivala, Ailachala-Vala* and *Pattenkollivala* were the main nets used in the mackeral fishery at Calicut and the former two were the principal nets at Cannanore. At Ernakulam, gillnet catches contributed the bulk of the landings, but occasionally small quantities were landed by the boat-seine units also.

Three different size groups were found to be contributing to the fishery in the Karwar region; at times a single catch was made up of two size groups. In the Calicut region the dominant sizes for the three months were, 19.5 cm, 20.5 cm and 21.5 cm respectively. In Cannanore and Ernakulam the 21-22 cm size and 20-21 cm size class respectively formed the bulk during the quarter. Immature fish in stage I or II of maturity dominated the cathes at all centres.

(Central Marine Fisheries Research Station, Mandapam).

(ii) **Oil Sardine Fishery.**

During the quarter ending December, 1960, the oil sardine fishery was good at Calicut, the catches were highest for any quarter in 1959 and 1960 and 3313 m. tons of oil sardine was landed at this centre. There were good catches in the Mangalore zone in October but the fishery declined in November. In December, however, the fishery improved again and heavy landings were reported in the last week of the month. The fishery was also quite good at Ernakulam. The oil sardine formed a minor fishery at Vizhingam yielding a total of 8,533 Kg. for the quarter. This fishery, however, was very poor at Karwar during the quarter, the total estimated catch being only 95·26 Kg. as against 1,14,152 Kg. during the last quarter of 1959.

The immature specimens in stages I and II of gonad maturity in size groups of 14 cm. or near about appeared to form the bulk of the catches of the quarter at most of the centres. The size frequency data appear to provide some support to the belief that the success of the oil sardine fishery may be dependent to some extent on the abundance and availability of the second year class.

Chalabale was the main net used for oil sardine at Mangalore (Ullal) the *Rampani* net was used in the northern centres of the Mangalore zone and the boat seines—*Paithuvala* and *Ailakolli-vala* were used in the southern centres of that zone. At Calicut 99% of the oil sardine landings of the quarter were made by the *Pathenkolli* units. At Ernakulam the oil sardine catches were mainly from the *Thanguvala.*

(Central Marine Fisheries Research Station Mandapam).

(iii) Prawn Fishery.

During the last quarter of 1960 the inshore prawn fishery along the west coast showed some improvement over that of the third quarter at some centres except in the Mangalore zone. In the Kanyakumari District also the prawn catches declined markedly at the commencement of the fourth quarter and by the middle of October came to a close practically at all centres in the District. Offshore operations were resumed in October at Cochin and Mangalore after the monsoon break and fairly good quantities of prawns were caught in the latter half of the quarter.

The catches consisted of a mixture of several species with one or two dominating. At most centres in the interior of the Gulf of Cutch *Metapenæus monoceros* was the most abundant species. Among other species noted may be mentioned *Leander* (*Palaemon sp*) *P. indicus, M. brevicornis* etc. In the outer Gulf instead of *M. monoceros, M. brevicornis* was one of commonest species.

Two noteworthy features of the landings in the Bombay zone are the reappearance of *solenocera indicus* in October and the virtual disappearance of *Palaemon tenuipes.* The fishery of *Acetes indicus* recovered in October after its decline in the previous two months and it was quite abundant in Versova followed by *M. affinis, P. sculptilis* was the most common species in the Bokshi catches at Arnala.

The offshore catches at Bombay were mainly composed of *M. affinis, P. stylifera, P. sculptilis* and *S. indicus.* At Mangalore *M. dobsoni* was the most abundant in October and *P. Stylifera* in the next two months. *M. monoceros* was the most common species off Cochin in November and *M. dobsoni* in December followed by *P. indicus* and *M. affinis* respectively.

While the fishery for *Palaemon carcinus* practically come to a close in November in Central Travancore, the lobster season in the Kanyakumari District started a little earlier than usual in the second half of November. The December catches have recorded a slight improvement over those of the same month in 1959.

The stake net fishery of Pulicat lake on the east coast continued to land fairly good catches in October, *P. indicus* and *M. monoceros* making up the bulk of the catches.

(Central Marine Fisheries Research Station, Mandapam).

(iv) Marine biological observations at Central Marine Fisheries Research Station

Although there were instances of occasional diatom blooms along the West Coast, on the whole there was a noticeable decrease in the diatom population and a corresponding increase in the zooplankters. "Red Water" phenomenon was reported off Canannore but with little adverse effects on the local fishery. The bottom fauna off Calicut was observed to be rather poor in comparison with the corresponding period of the previous year and perhaps owing to this

scarcity bottom feeders like *Cynoglossus*, Sciaenids etc. were found to be feeding on forms that are found in the bottom layer of water. Planktological and allied investigations in Palk Bay were interrupted due to unfavourable weather conditions. The study of organic production off Mandapam and Calicut were continued and the estimation of production using 14C was initiated.

(Central Marine Fisheries Research Station, Mandapam).

(v) Pearl Fisheries of Tuticorin

The Pearl fishery of Tuticorin is a State monopoly in Madras. The fishery had been sporadic and intermittent. Since 1663, only 26 fisheries have taken place. The 1955—1960 series has set up many records of production and receipts in revenue. The maximum number of pearl oysters fished in any one fishery was witnessed in the 1958 fishery with 2,14,76,514 oysters while the maximum record revenue to the State was Rs. 8.00 lakhs in 1959 fishery. The record catch for any one single day was 724,771 on 21st May, 1958, while the maximum receipt of Rs. 31,867 was recorded on 24th April, 1959.

The pearl oyster flourish in certain localised areas called 'paars' lying between Vaipaar and Manapad, off Tuticorin at varying depths from 8 to 10 fathoms. Since the last series of pearl fishery in 1926—28, the department had been collecting scientific data on the pearl oysters and continuing routine inspection of the pearl banks on which the conduct of the pearl fishery is based.

The season for the pearl fishery is ordinarily from February to May. Divers are recruited from Tuticorin, Colachal, Kadipatnam, Periapatnam, Kilakarai, Rameshwaram and Karangadu. The strength of the diving force engaged in these operations has increased considerably in recent years and in 1959 fishery, the number of men registered was 1,680 and boats 152. Each canoe carries a complement of 10 divers and 5 assistants. Two thirds of the catches are taken as the government share and the rest returned to the divers as their share. The Governments hare of oysters are packed in gunnies of lots of 1,000 and auctioned.

The extraction of the pearls is by a process of decay of oysters. The 1958 and 1959 series catch has been estimated to have produced nearly $6\frac{1}{4}$ lakhs Carats of pearls of different types at an estimated value of Rs. 25 lakhs. A good percentage of this has been exported. Individual pearls of lustre and size have been recorded in 1959-60 series.

The following statement furnishes the achievements of Pearl fisheries since 1955.

Year	Total No. of days the fishery was in progress	Total Catch of cysters	Gross Revenue to the Government
			Rs.
1955	44	35,08,967	1,46,138
1956	18	21,29,058	45,454
1957	51	1,11,75,214	1,68,807
1958	54	2,14,76,514	4,74,096
1959	61	1,64,28,298	8,73,001
1960	42	1 61,88,339	1,99,566

(Director of Fisheries, Government of Madras).

(vi) Review of the Indo-Norwegian Project for the quarter ending December 1960

Fishing Section

Experimental trawling, purse seining, troll line and handline fishing were conducted by Medium boats, F/V 'Flying fish', 'Ashtamudi', R/V 'Kalava', INP boats, and 'Ovald' boats which operated from four centres of Quilon, Cochin, Tellicherry and Beypore.

The total quantity of fish landed during the quarter by the Project vessels was 234,856 kos. sold for Rs. 67,583. The quantity and value of fish yielded during the quarter as compared to the corresponding quarter of 1959 was higher by 40% and about 200% respectively. The increase in the quantity of fish landed is the combined result of higher intensity in fishing operations and success in trawling. The remarkable improvement in the sale proceeds of the fish is the direct result of the departmental marketing in contrast to the practice of marketing through a contract basis in 1959.

Compared to 1959, the fishing results of 22 ft. mechanised boats in 1960 were better by 40% in respect of catches and 60% in value. 56 numbers of 22 ft. mechanised boats registered 2424 trips landing 308,173 kos. of fish valued at Rs. 96,180. The quarterly turnover of a boat in 1960 were 5503 kos. of fish to the value of Rs. 1717 compared to 4791 kos. of fish for Rs. 1314 in 1959. The 25 ft. mechanised boats operated 941 trips and landed 152,412 kos. of fish worth Rs. 48,352. Whereas the quarterly average catch and value per trip in 1959 was 103 kos. of fish and Rs. 24 respectively, it was 162 kos. of fish and Rs. 51 in 1960.

Boat building Programme and overhauling and maintenance.

Under the boat building programme one 25 ft. INP boat and one 23½ ft. 'Ovald' boat were completed and issued while five 25 ft. INP boats, 2 'Ovald' boats and three 36 ft. 'M' boats (stern trawlers) were under various stages of construction and completion. One 36 ft. 'M' stren trawler is expected to be completed and start fishing operations during January, 1961. At the Boat Building Yard and work shop various maintenance and repair work including installation of engines were undertaken on 'M' boats, 'Flying Fish'. 'Ashtamudi' R/V 'Kalava', INP boats, 'Ghana' and 'Pablo boats. 249 repair work orders on mechanised boats issued to fishermen were completed. Routine service and maintenance work on all the electrical and electronic equipments on board the boats based at Cochin were done. At INP Sea-house, Cochin, repairs of nets and fabrication of new fish trawls were carried out by the crew members.

Refrigeration

At the Refrigeration Plant, 86,509 Kos. of fish and 9242 kos. of prawns were received of which 80,776 kos. was issued for marketing and 5669 kos. for deep freezing. During the quarter 5,59,300 kos. of ice was produced. 6,20,600 kos. was sold and the value received from sale to private parties was Rs. 24,370 for 487,400 kos. of ice.

Marketing.

Fish landed by the Project's fishing vessels was marketed in the Hilly regions of the State by the marketing section. 89,694 kos. of fish was marketed from

Quilon for Rs. 289,85. Because of the heavy supply of mackerel and sardine from other coastal regions at the High Ranges, the demand in all the distribution centres was low during the quarter. A new route, Quilon-Shencottah was taken up and markets explored which have been found satisfactory. At Cochin, sale of fish was taken up departmentally and 88,556 kos. of fish and 7556 kos. of prawns were sold from Cochin for Rs. 29,418. A quantity of 23,615 kos. for Rs. 3,549 and 29,702 kos. for Rs. 7,582 was disposed of from Beypore and Tellicherry respectively. Total sales effected by the Project during the quarter was 2,39,123 kos. amounting to Rs. 69,535.

MARINE RESEARCH.

R/V 'Kalava' conducted exploratory fishing with trawls, drift nets and handlines from West of Mangalore and southward along the continental shelf.

HEALTH SECTION.

Routine clinical work was carried out at the Preventive and Curative Clinics and at the Maternity Ward. 1,340 home visits were made in connection with maternity work. The average number of consultations at the Curative clinic on every clinic day was more than 250. 258 tuberculin tests were done and 85 B,C.G. vaccinated. School Health Work and Social Work were continued and the Family Planning Clinic was in continuous operation. Environmental sanitation of the area has considerably improved and there are now 1,323 private latrines in the areas.

CONSTRUCTION WORK:

The foundation stone for the INP Fishery Station at Ernakulam was laid in December, 1960. Plans have been prepared for the jetty, Boat pier, compound wall and water tank. In the Project area construction work of the store and welfare building at the boatyard and all buildings to be constructed at the Refrigeration Plant have been in progress. In the Health Section the quarters for the Assistant Surgeon and the laundary building at the Victoria Hospital have been completed. All equipment received from Norway for the Public Health Laboratory has been installed. About 42% of the main water supply line has been laid and the High Reservoirs have been constructed.

ADMINISTRATION.

Dr. Johs Solem, leader of the Health Section and the Public Health Nurse left the Project on termination of their assignments. Five Norweigan Officers arrived for the health, training and engineering works during the quarter. There have been a few changes in the Indian staff.

During the quarter the Norwegian expenditure in Norway and India was Rs. 6,35,600 and Rs. 2,94,200 respectively. The total expenditure since its inception was approximately Rs. 243,30,932.

The Indian expenditure during the quarter was Rs. 1,72,454 bringing the total to Rs. 28,50,819. The revenue realised was Rs. 88,175.

(vii) Government of India Deep Sea Fishing Stations

During the quarter ending December, 1960 the exploratory fishing operations of the Government of India Deep Sea and Offshore fishing stations are as follows :—

Name of the Vessel	No. of days absent from the port	Quantity of fish caught	Catch/days' absence	Value realised
		kgs.	kgs.	Rs. nP.
Cochin				
M. T. Pratap	47	82,572	1,757	6035·86
M. L. Durga	40	33,523	838	5422·19
M. V. Tarpon	59	39,572	671	4695·33
M. V. Samudra	32	22,114	691	3458·81
M. V. Bangada	5	2,236	442	294·79
Tuticorin				
M. V. Sardinella	62	13,351	215	2134·89
M. V. Sagar Sundari	58	19,159	330	2518·04
M. V. Meenakshi	59	3,768	64	964·45
M. V. Meenalochani	23	11,500	500	1404·39
Visakhapatnam				
M. T. Ashok	11	3,413	310	1759·00
M.V. Gudjon	39	17,137	439	8664·25
M. V.Sagarkumari	38	8,234	217	4208·00
M.V. Sea Horse	22	6,693	304	1409·50
Dan No. 1	21	507	24	357·50
Dan No. 2	12	11,293	941	5577·75
Bombay				
MFV Jheenga	44	105,834	2,405	19301·60
MFV Bumili	46	38,649	840	10269·36
ML Meera	43	12,079	281	2231·54
MFV Sagarkanti	38	4,199	111	2348·07
MFV Sagar Pravasi, MFV Champa, MFV Sagar Vihari	No fishing due to repairs.			

(viii) The Landings of Four Bull Trawlers of New India Fisheries Ltd., Bombay for the Quarter Ending December, 1960:

Name of the Vessel	Period of Voyage	No. of days absence from Port	Quantity caught (Tons)	Catch/days' absence (Tons)	Depth Fished (Metres)
'Satpati' & 'Pilottan'	1-10-60 to 10-10-60	10	70	7·0	27—36
	12-10-60 to 21-10-60	10	77	7·7	18—35
	6-11-60 to 14-11-60	9	78	8·7	23—38
	16-11-60 to 26-11-60	11	85	7·7	26—40
	28-11-60 to 8-12-60	11	82	7·5	24—40
	9-12-60 to 19-12-60	11	80	7·3	26—40
	21-12-60 to 31-12-60	11	63	5·7	27—40
Arnala' & 'Paj'	5-10-60 to 14-10-60	10	65	6·5	34—38
	16-10-60 to 27-10-60	12	73	6·1	18—34
	29-10-60 to 8-11-60	11	70	6·4	20—37
	26-11-60 to 5-12-60	10	55	5·5	27—39
	6-12-60 to 17-12-60	12	70	5·8	27—35
	18-12-60 to 27-12-60	10	61	6·1	26—42

(ix) The Government of India Quick Freezing and Cold Storage Plant at Bombay.

During the quarter ending December, 1960 the income realised from different activities were as follows:—

Activity	Value realised
	Rs. nP.
(1) Sale of ice (948 M. Tons 350 kgms.)	30,954·27
(2) Basket Storage of fresh fish	12,517·45
(3) Freezing charges of fresh fish	13,879·00
(4) Frozen fish storage rental	13,903·50
TOTAL	71,254·22

INLAND

(i) Fishculture in Bhakra Reservoir

The completion of Bhakra Dam will create a 55 mile long lake with a minimum area of 17,000 acres and a maximum area of 39,000 acres giving an average water spread of 25,000 acres. Scheme for the development of fish in Bhakra Reservoir (Govindsagar) has been included in the Third Plan of Punjab Government at a cost of Rs. 20 lakhs. A preparatory scheme at a cost of Rs. 47,000 has already been taken up during the current financial year, in order to complete preliminary arrangements such as survey of site for locating fish seed farms and ordering necessary equipment in connection with the main scheme. Three experimental tanks and small office and laboratory have already been constructed and skeleton staff appointed. An officer has been trained in deepwater netting, under an F.A.O. Russian Expert. Small consignments of all the cultural species to be introduced in the lake have also been raised in the experimental tanks.

It is proposed to acquire about 60 acres of land for constructing fish seed farms and hatcheries and nearly one crore of fingerlings will be produced during the Third Plan period. No production can be, however, expected in the first three years but exploitation will be undertaken thereafter. Techniques of exploiting deep water fisheries will also be developed and demonstrated to private fishermen during this period. When Govindsagar is fully developed and properly exploited it is expected to produce 25,000 maunds of fish annually. This will practically double the present production of fish in the State.

Himachal Pradesh is also taking up stocking of Govindsagar in the upper reaches and hatchery for mirror carp is being established under scheme costing Rs. 7·00 lakhs during the Third Plan

(Agriculture Department, Government of Punjab).

(ii) Estimated fish Production from Reservoirs and irrigation canals in metric tons.

State	1956-57	1957-58	1959-60
(1) U. P.	117	163	153
(2) Orissa.	..	..	2·9
(3) Delhi .	1·4	1·4	4·8
(4) Kerala	1·2	3·4	3·7
(5) Madras	3677·9	4216·4	4673·6
(6) Mysore	1016·0	1306·6	1497·6
(7) M. P.	58·2	111·2	313·5
(8) Andhra Pradesh	5·4	7·6	..

(iii) Induced Spawning of Major Carps in Maharashtra State.

Attempts were made at Bombay and Nagpur on induced spawning of Major Carps by administering pituitary hormone. Spawning was successfully induced in 'Rohu and Mrigal'. Over 2,00,000 spawn was obtained as a result of these experiments. These preliminary trials gave encouraging results to considerably increase the output of spawn next year.

(Director of Fisheries, Government of Maharashtra, Bombay).

TECHNOLOGY

(i) Experiments on live lobster packing.

Frozen lobster tails, which are increasingly in demand in the U.S.A. and European countries, are processed after removal of Cephalothoracic region which is nearly 40 per cent by weight of edible portion in a lobster. Considerable loss, is, therefore, involved in this processing. Alternately, lobsters are sent alive and the method in vogue in foreign countries is to keep live animals in layers of wet wood-shavings along with ice kept in plastic bags—all packed in a card board carton. This method is in practice for only short distance transport comprising four to six hours journey and involves expenditure as air freight on ice. To devise a suitable method for journeys of longer duration and to do away with ice, attempts were made to tranquillise lobsters. Some of the chemical tranquillisers which were tried, had no advantageous effect. It was also learnt that the health rules in foreign countries did not permit using such tranquillisers for food articles. Subsequently, live lobsters were thermo-tranquillised at about 50°F and few consignments were sent by air to Zurich with the cooperation of Cargo Department of the Air India International. Reports from importers revealed that lobsters were received in very good condition.

(Director of Fisheries, Government of Maharashtra, Bombay).

(ii) Shark Liver Oil making in West Bengal.

Shark liver oil which is used by the medical profession as a substitute for cod liver oil and considered to have richer vitamin content, is now being extracted on a commercial scale at Government Fisheries Centre at Jaunput, a sea side village south of Contai. Crude oil to the extent of 1500 lbs was extracted from shark liver in 1959-60 which when refined and blended gave 6,000 lbs of 'Shaliverol' the trade name under which the oil is marketed.

Shark is caught by fishermen in the course of their fishing operations at sea both near Jaunput and Jaida and the shark liver supplied to the Fisheries Centres. Oil is then extracted from the liver under special supervision in a special device designed by the Fisheries Department. The crude oil is then refined into 'Shaliverol' of two grades at the Technological laboratory in Calcutta. The entire output of the superior grade having high vitamin A and D content is supplied to the Health Department who have requirements for a total of 10,000 lbs and the inferior grade of lower vitamin content is sold to poultry farms to be used as poultry feed.

The centre at Jaunput is also drying shark flesh as an experimental measure to market it as dog food. Experiments with shark fins for the production of glue is also going on.

(Amrita Bazar Patrika, Calcutta, 19-12-1960).

(iii) Studies on Reservoir Fisheries.

Deep water fishing experiments were carried out in the Mettur, Krishnarajasagar and D.V.C. reservoirs by Mr. S. B. Gulbadamov, F.A.O. Gear Technologist, in collaboration with the Lacustrine Unit of the Central Inland Fisheries Research Station. In Mettur the average catch in the newly designed nets were about 4-5 times more than in the nets used by the local fishermen. Experiments on light fishing indicated preference of yellow light for congregation of fishes and plankton. Red light proved negative. It was found possible to select suitable fishing grounds in the deep water reservior by an echo sounder survey.

Experiments in Krishnarajasagar reservoir showed that for successful exploitation of the reservoirs it is necessary to select the mesh size of the gill nets on the basis of the species of fishes occurring in each and that a uniform mesh size will not be suitable for all reservoirs.

Extensive data on the nature of fish population in Mettur, Krishnarajasagar and D.V.C. reservoirs have been collected. Studies on the fish populations of the Tungabhadra reservoir indicate that it will be necessary to introduce quick growing species of fishes if the yield from the reservoir is to be enhanced.

A short course of training in methods of fishing in deep water reservoirs was conducted in the D.V.C. reservoirs by Mr. S. B. Gulbadamov, in close collaboration with the Lacustrine Unit of the Central Inland Fisheries Research Station.

(Central Inland Fisheries Research Station, Barrackpore).

TRADE.

(i) Exports from India for the half year ending June, 1960.

Articles and Countries to which exported	Quantity (Cwt.)	Value (Rs.)
Fish Fresh or simply preserved.		
Fish Fresh chilled or Frozen		
Fresh Fish live or dead others.		
Bahrein Is	25	3431
Kuwait	51	5870
Singapore	339	28845
Saudi Arab	5	870
Nepal	..	4
West Germany	4	1266
Bangdas wet salted		
Ceylon	4070	143786
Soormai wet salted		
Ceylon	3240	166218
Other Fish Wet salted		
Ceylon	1030	41664
U.S.A.	74	16328

Articles and Countries to which exported	Quantity (Cw.)	Value (Rs.)
Fish salted dried or smoked but not further prepared.		
Bomlas dry unsalted		
U.K.	132	38868
Kuwait	3	290
Ceylon	19311	2129461
Singapore	214	18325
Zanzibar	5	200
Kenya	8	909
Tanganyika	9	764
Mauritius	1400	132991
Australia	15	1255
Fizi Is	22	3250
Burma	1194	110638
Rhodesia S.	10	1620
Fish dried unsalted other sorts		
U. K.	16	3979
Ceylon	14231	1675978
Singapore	44	5424
Malaya	88	23866
Saudi Arab	1	78
Fizi Islands	3	305
Fish dried salted		
Ceylon	88766	9245358
Tanganynika	1	45
Belgium Congo	..	62
Fizi Islands	4	475
Shark fin Fishmaw similar Fish parts.		
U. K.	1095	511253
Singapore	1657	460692
Hongkong	209	103987
Malaya	7	2000
Other Sorts		
Ceylon	179	12201
Singapore	43	3108
U.S . A.	23	4856
Crustacea and Molluscs Fresh Chilled Frozen salted dried or simply cooked.		
Crustacea excl. Prawn.		
U.S.A.	229	78897
Singapore	105	8006
Prawns.		
U. K.	284	75220
France	80	19163
Ceylon	3023	343022
Singapore	1722	262144
Hongkong	1388	186447
Saudi Arab	62	10403

Articles and Countries to which exported	Quantity (Cwt.)	Value (Rs.)
Burma	11171	2915146
Mauritius	376	75864
Canada	54	20510
U.S.A.	8939	1974605
Australia	303	96313
Fizi Islands	4	1410
Sweden	28	6351
Netherlands	13	3081
Italy	10	3974
Malaya	377	18770
Kenya	3	1541
Cuba	27	8535
Molluscs		
Italy	13	7852
Fish and Fish preparations canned or not. Fish, Fish products and Fish preparations in airtight containers including Crustacea and Molluscs. Crustacea and Molluscs Preparation canned.		
U. K.	7	2770
Denmark	21	8611
Belgium	1	329
Italy	21	12208
Aden	12	5870
Kuwait	6	3440
Sweden	3	1175
Kenya	3	1469
Mozembique	16	10680
U.S.A.	25	12783
Sardines and Pilchards Canned		
Canada	2	1170
Fish canned excluding Sardines and Pilchards		
Sweden	95	40913
Denmark	13	8801
Germany W.	20	11994
Switzerland	27	11222
Italy	34	7660
Greece	7	3347
Cyprus	5	3310
Aden	6	3343
Trcl Oman	3	2269
Singapore	20	9501
Lebanon	13	2638
Kenya	6	2706
Canada	259	64714
U.S.A.	2741	620241
Fizi Islands	3	1762
U. K.	37	17893
Netherlands	20	9272

Articles and Countries to which exported	Quantity (Cwt.)	Value (Rs.)
Other sorts.		
Sweden	17	7779
Aden	3	2047
Syria	3	1424
Nepal	3	270
Kenya	16	8358
Cyprus	5	3250
Trcl Oman	4	2795
Fish, Fish products and Fish preparations not in airtight containers including Crustacea and Molluscs.		
Fish Products preparations not canned.		
U. K.	41	9727
Saudi Arab	4	1105
Aden	1	327
Bahrein Islands	1	104
Ceylon	10	296
Malaya	514	7740
Kenya	3	656
Tanganyika	4	636
Animal oils and Fats—oils from Fish and Marine animals.		
Shark Liver Oil Commercial quality.		
Ceylon	2	333
Others.		
Kuwait	125	2200
Trcl Oman	541	14704
Maldives	63	3075
Muscat	19	330
Saudi Arab	351	10070
Kenya	16	525
Tanganyika	63	1800
Pearls worked and unworked.		
Natural and cultured Pearls unworked		
Pearls Natural		
Italy		4445
Ceylon		4541
Pearls cultured		
Ceylon		1722
Natural and cultured Pearls worked but not set		
Pearls Real worked		
Iraq.		34494
Kuwait		124634
Pearls cultured worked		
U.S.A.		5192

(ii) Import in India for the half year ending June, 1960.

Articles and countries from which imported	Quantity (Cwt.)	Value (Rs.)
Fish fresh or simply preserved		
Fish fresh chilled or frozen		
Hilsa live or dead		
Pakistan E.	13279	1323843
Fresh fish live or dead		
Others.		
U.K.	3	2171
Ceylon	..	40
Hongkong	1	2218
Pakistan W.	567	40874
Pakistan E.	121896	13177296
Bangdas wet salted		
Pakistan E.	100	15072
Soormai wet salted		
Pakistan W.	34	4871
Saudi Arab	3070	165555
Other fish wet salted		
U.K.	506	23093
Pakistan W.	15824	671705
Pakistan E.	6161	530667
Hongkong	170	3400
Fish salted dried or smoked but not further prepared		
Bombas dry unsalted		
Pakistan E.	1904	102173
Fish dried unsalted		
other sorts		
Pakistan W.	1968	45184
Pakistan E.	1099	60939
Hongkong	9	1327
Muscat	1292	25841
Maldives	15	1726
Japan	..	•230
Fish dried salted		
Pakistan E.	427	22765
Hongkong	1	99
Fish smoked		
Denmark	5	1867
Germany W.	3	286
Other sorts		
Pakistan E.	31	3600
Shark fins Fishmaw		
similar Fish parts		
Hongkong	1	555

Articles and countries from which imported	Quantity (Cwt.)	Value (Rs.)
Other Sorts		
U.K.	..	56
Hongkong	2	1119
Japan	..	82
Fish and fish preparations canned or not. Fish, Fish products and Fish preparations in airtight containers including Crustacea and Molluscs.		
Crustacea and Mollusc prep canned		
U.K.	..	774
Japan	1	480
Fish Canned Excl Sardines and Pilchards.		
U.K.	108	19683
Sweden	1	509
Norway	..	20
Denmark	2	973
Germany W.	3	1596
Portugal	1	458
Switzerland	..	25
Singapore	..	164
Hongkong	14	3192
Japan	5	840
Sardines and Pilchards canned		
Portugal	9	1077
Norway	107	14514
Germany W.	..	39
France	1	471
Other sorts		
U.K.	2	553
USSR	4	600
Sweden	1	287
Singapore	..	203
Fish, Fish Products & Fish preparations not in airtight containers including Crustacea & Molluscs		
Fish Product prep. Nes not canned.		
U.K.	9	1410
Denmark	2	1192
Sweden	1	112
Meat Meal including Tankage & Fish Meal		
Fish Meal		
Sweden	..	500
Animal oils and fats		
oils from fish and marine animal		
Cod Liver oil in other containers		
U.K.	236	15552
Norway	492	33843

Articles and countries from which imported	Quantity (Cwt.)	Value (Rs.)
Sperm oil		
U.K.	448	31590
Norway	110	7447
Whale oil crude		
U.K.	37	2726
Others		
Iraq	..	12
Natural and cultured Pearls unworked.		
Pearls Natural		
U.K.		11348
Bahrein Is.		332648
Kuwait		59884
Trcl Oman		53107
Hongkong		15194
Japan		632821
U.S.A.		78273
Pearls Cultured		
Hongkong		26525
Japan		1470567
Natural and Cultured Pearls worked but not set.		
Pearls Real worked		
Japan		12994
Kuwait		49200
Pearls cultured worked		
Japan		6333
Pearl Buttons		
Japan	78 (Grs)	713

(iii) Programme in Fish Marketing in the States

Maharashtra has set up a Fisheries Cooperative Federation tor marketing of fish in Bombay. The Federation charges a commission of 6¼% on the sale proceeds but only 10-15% of the total fish received in Bombay is being handled by the Federation. The Government has taken steps to collect fish marketing intelligence to be passed on to the interested parties. Technical guidance and financial assistance for construction of new fish markets or remodelling of the old ones are provided to the Municipalities and Gram panchayats.

In Kerala, the Indo-Norwegian Project initiated a pilot fish marketing scheme in 1957. The scheme has succeeded in popularising iced fish in the marketing routes, which were established after considerable survey and assessment of the marketing potentialities. It is envisaged that this scheme would ultimately be run on cooperative lines. With the establishment of a cold storage and refrigeration plant in Quilon, frozen fish has also been made quite popular. In 1959, a sales organisation comprising of the owners ol mechanised boats at Quilon was set up and the members were assured ol minimum beach-prices for different species, which were a little higher than the prevalent rates. This price incentive coupled with the system of cash payment attracted the attention of other fishermen and it is expected that a large marketing organisation will soon be established.

In U.P., Fisheries Cooperative Societies and Marketing Unions are being organised in an integrated manner. Ice and cold storage plants are also being established in the State. The existing fish markets owned by the local bodies are being made to conform to modern hygienic standards.

Preliminary survey on the role of the Government of Madras to develop fish marketing was conducted by the F.A.O. Fish Marketing Experts and their recommendations are being implemented. The survey of the marketing conditions is being continued to explore the ways and means of speeding up the development of transport and marketing on modern lines.

The Punjab Government is establishing five cold-storage plants in various parts of the State and fish is sold in the markets owned by private parties or Municipalities.

(ii) Transportation Facilities in Fish Marketing

The Andhra Pradesh Government has provided twelve insulated Vans and two carrier boats to fishermen for transport of fish to the markets. To effect speedy transport of fish, the Government of Maharashtra have taken steps for reservation of sufficient space in brake-vans for loading of fish at important rail-heads, increasing the stoppage time at loading centres, arranging despatch of fish by fast trains, relaxing quota for fish parcels at peak seasons and giving priority to fish consignments. About twenty launches and an equal number of sailing boats are engaged in transport of fish from distant fishing grounds to Bombay. Among the large number of trucks operated for transport of fish within the radius of about 150 miles around Bombay, 25 trucks are owned by the Fishermens' Cooperatives for the purchase of which assistance in the form of loans was given by the Government. Some of the trucks of the Cooperatives' help the fishermen to reach the retailed markets with their fish and to get back to their villages after disposal of the fish.

In Kerala, the Indo-Norwegian Project operates a fleet of six insulated vans for marketing fish.

In U.P. the State Fisheries Departments have been collecting data on the quantity of fish sent out from the State.

In Madras, fish is transported by Lambrettas, motor vans, mechanised boats and railways. The movement by rail is entirely by passenger trains. The Department of Fisheries provides transport vehicles to fishermens' Cooperative societies on hire-purchase basis. A total number of 11 motor vans and 9 Lambrettas have been supplied so far. At Mettur Dam, 2 Motor Luggers have been given to the Fishermen's Society for collection of fish at various points.

FISHERIES DEVELOPMENT IN THE STATES

(i) Fisheries development in Maharashtra State

The Fisheries Technological Laboratory of the State Government has shown considerable progress in manufacture of different products of Shark Liver Oil. During the quarter ending September, 1960, 82,764 litres of Sharkovit, 181 litres of Elasmin liquid, 4191 of 100 per bottle and 195 of 1000 per bottle Elasmin pearls, 3431 lbs. of Sharkomalt, 5018 lbs. of Veterinary grade Shark Liver Oil D. 3—and 35,000 Kg. of fish meal were manufactured.

Under the Second Five Year Plan marine fisheries schemes, 25 fishermen were granted loan to the extent of Rs. 128,000 for repair of boats and nets and 27 fishermen were granted loan and subsidy amounting to Rs. 216,000 and Rs. 1,45,000 respectively for purchase of engines to mechanise their boats. The scheme to establish a cold storage plant at Nagpur to afford refrigeration facilities for preservation of fish in the Vidarbha region at a total cost of about Rs. 42,000 initiated in 1959 has shown good progress. The building is ready and the installation of the plant will shortly commence.

Under the scheme of training and demonstration, two batch each of 18 and 24 students successfully completed their six-monthly and three monthly course in fishery respectively at the Training Centre, Versova.

More than 6 million of carp fry transported from Calcutta were stocked in various tanks and rivers in the State during the quarter ending September, 1960.

(Director of Fisheries, Maharashtra State, Bombay.

(ii) **Fisheries Schemes in Saurashtra**

Under the schemes for mechanisation of fishing crafts, supply of modern fishery requisites and improved type of wooden boats to fishermen, a sum of Rs. 2,55,715, Rs. 4,97,150 and Rs. 65,690 respectively have been advanced as loans and subsidies to fishermen during the quarter ending December, 1960. The estimated fish production per annum by increase in the number of motorised fishing vessels is 12,000 tons and by the two demonstration boats is 300 tons. The Fisheries Department operates two boats for demonstration purposes and one for training in Saurashtra. Under the training scheme 43 candidates will receive training in modern methods of mechanised fishing by the end of March, 1961.

Two departmental ice factories, one 5 ton ice factory with 12 tons storage capacity and another 12 ton ice factory with 100 ton cold storage capacity have been set up at Mangrol and Veraval respectively. The department produced about 2000 gallons of neat shark liver oil.

Three additional schemes *viz.* Demonstration of mechanised fishing, Survey and exploratory fishing and establishment of nylon twine and net making plant have been sanctioned at an estimated cost of Rs. 10 lakhs.

(Director of Fisheries, Gujerat)

(iii) **Inland Fisheries in Andhra Pradesh**

It is estimated that there are 11,84,000 acres of inland waters including estuaries and backwaters in this State which are rich in fish seed resources of quick growing varieties of fish like Catla, Mrigal, Chanos etc. The Fisheries Department has been collecting fish seed of these species every year and stocking them in inland waters. They are kept in the nearest nurseries till they are lifted and stocked in the tanks taken over by them for the development of fisheries, of which there are about 785 in the Andhra region and 20,584 in the Telengana region. On the recommendations of the Ministry of Community Development and Cooperation, the Government of Andhra Pradesh have requested all Panchayat Samitis to select at least one tank in each Gramsevak's Circle in their jurisdiction as a first step and develop and demonstrate fish culture with a view to disseminating knowledge of fish rearing on scientific lines and rouse the enthusiasm of the public interested in fish culture.

(Deputy Development Commissioner, Government of Andhra Pradesh—Hyderabad)

(iv) Inland Pisciculture in Uttar Pradesh

During the quarter October to December, 1960, 19,68,850 fry and 42,27,216 fingerlings were collected from natural spawning grounds as against nil and 17,42,692 respectively during the corresponding quarter of the last year. To increase fish production 34,61,997 fingerlings were stocked in departmental waters and 14,74,707 fingerlings were supplied to the private pisciculturists for stocking the waters owned by them as against 53,36,049 and 8,07,305 respectively during the corresponding quarter of 1959.

(Director of Animal Husbandry, U.P.).

(v) Fish Seed Collection in Orissa in 1960

Total production of fish fry by Orissa Fisheries Department was 1,05,00,000 out of which 73,00,000 were sold to the Gram Panchayats and the public. The receipts to the Department was in the region of Rs. 1,35,000. There was a fall in production upto 50% on account of nearly 10 fish farms suffering severe damage due to the flood and the spawn collection being poor during the year.

(Director of Fisheries, Orissa.)

(vi) Power Fishing by the State Department of Fisheries, Orissa

Power fishing in the Sea was started at Paradwip with M. L. Shrimp, M.L. Pablo and M. L. Dan, No. I. The F.A.O. steel Dory was also put into Commission. The catch upto end of December 1960, was 99,988 lbs.

(Director of Fisheries, Orissa.)

MARINE FISHERIES RESEARCH

Scientific Report of the Central Marine Fisheries Research Station, Mandapam for the period 1st April to 31st December, 1960.

Fishery Survey :

The analysis of the data collected during the first three quarters of 1960 was completed during the period under review. The total landings of marine fish during the period was estimated at 386,507 metric tons as compared to 373,415 m. tons for the corresponding period of 1959, showing an increase of over 13,000 tons. During the first quarter Oil Sardine and Mackerel accounted for a short-fall of 56,000 m. tons due to the failure of these fisheries in Kerala, Mysore and Southern Bombay. The landings in West Bengal and Orissa and all the States on the West Coast of India declined during the Second Quarter of 1960 as compared to the corresponding figures of 1959. In Kerala the decrease in landings of Mackerel and Sardines was 10,907 m. tons and in Mysore the landings were nearly half that of 1959, Mackerel and Oil Sardine being totally absent. But the landings in Andhra were more than double and in Madras were higher by about 11,000 m. tons in 1960 as compared to 1959. During the third quarter of 1960, barring Madras and Mysore, landings in all the maritime States showed improvement as compared to those of last year. The landings of sardines increased by about 25,000 m. tons due to higher landings in Kerala.

Fishery Biology :

Inshore fisheries investigations on the major shoaling fisheries of Oil Sardine, Other Clupeids and Mackerel were continued at Karwar, Mangalore, Kozhikode, Ernakulam, Neendakara, Vizhingam, Mandapam, Porto Novo and

Waltair. Studies were carried out on the trend of the various fisheries during the different months, total annual catch at important fishing centres, gear employed, length frequency, size and year class, composition of fishery, food and feeding habits, growth, maturity, fecundity, sex-ratio and percentage distribution.

An unusual occurrence of juveniles of Oil Sardines of 80-110 mm. range in large quantities at Calicut during the second half of July was the high light of this years Oil Sardine fishery. Oil Sardine landings at Calicut during the quarter ending December, 1960 were the highest recorded during any of the quarters of 1959 and 1960. The modal size of the Oil Sardine landed was within the range of 140-149 mm. A bumper Oil Sardine fishery contributed mainly by this size group lends further support to the belief that the success of the Oil Sardine fishery is perhaps dependent on the availability of the second year class.

Mackerel fishery was a failure at all the centres on the West Coast during the second quarter; there was marked improvement in the third quarter. The season of Mackerel fishery commenced comparatively early at Karwar in the fourth quarter and heavy catches were recorded breaking all previous records in the number of fishing days, number of 'Rampan' hauls and in the total catch. Generally the fishery was composed of immature fish. This fishery was a success in Mangalore, Cannanore, Calicut and Ernakulam.

Investigations on the biology and inshore fishery of species of prawns and lobsters of commercial importance with regard to gear used, area exploited and the species composition of the catches were continued at the various centres of Bombay, Mangalore, Calicut, Ernakulam and Madras. Routine collection of data of this fishery were continued in regard to size, growth, maturation and breeding. Occurrence of post larvae of *M. monoceros* in inshore waters rule out the possibility of this species breeding in the offshore waters. Detailed analysis of the catches of INP vessels revealed that the most productive area appear to be between 11 and 18 metres. The study of the fat content in the muscle of *M. affinis* started at Bombay revealed differences between the sexes and at different stages of maturity. The Stake net prawn fishery of the pulicat lake and Palaemon fishery at two centres in Kerala were under observation. Biological data relating to the offshore catches of prawns by regular study of samples have been collected at Ernakulam. A monthly survey at 5 centres along the Pampa river has been started to gather information on the distribution and growth of young prawns. Life history studies of crustaceans from Plankton larvae were continued.

Biological investigations on the fisheries of Bombay duck, Malabar sole, Half-beaks, mullets and Tunnies were continued. The fecundity and fecundity factors of *Hyporhamphus georgii* and *Hemirhamphus marginatus* and length-weigth relationship of *Mugil cephalus* have been worked out. Biological studies on the skip jack *Katsuwonus pelamis* from the Laccadives and Minicoy have been continued. Keys to the identifications of the seven different stages of maturity of the principal bait fish of tuna, *Lepidozygous tapeinosoma* month-wise percentage distribution of the live bait, size at first maturity, relative condition factor and other aspects of its biology were completed.

The under water survey of pearl and chank beds carried out during 1958-59 was continued for about a month and a half during the fourth quarter of 1960 when Dr. Salvadori F. A. O. Under Water Expert was in Tuticorin.

At the Molluscan Research Unit studies on the seasonal gonadial variation of adult pearl oysters were continued. Studies indicated that June is probably

the spawning period of oysters in Tuticorin area. An attempt was made to study the setting of Oyster spat during different periods in the year in Tholayiram paar at Tuticorin.

Offshore Fisheries Investigation :

Offshore fisheries investigations were continued at Bombay, Ernakulam, Tuticorin and Waltair and the Units were engaged in collecting and analysing the data of fish catches of New India Fisheries Trawlers at Bombay and the Government of India power fishing vessels operating at Bombay, Cochin, Tuticorin and Visakhapatnam with regard to the gear employed, intensity of fishing, seasonal variations and monthwise fluctuations of the catches, compositions of fish catches in different fishing grounds and catch-per-unit of effort. The two pairs of bull-trawlers of the New India Fisheries Ltd., Bombay, continued their commercial bull-trawling operations in Bombay and Saurashtra waters even during the monsoon months. The vessels of the Deep Sea Fishing stations operated Larsen trawl, shrimp trawl, Nylon gill nets and Russian trawl nets. The overall catch-per-unit effort for the months of August, September, and October, 1960 showed an upward trend. Experimental fishing with trolling lines was attempted on a major scale for the first time at Ernakulam in September, 1960.

Studies on the fishery and biology of commercially important species of the trawler catches of Dara, Ghol, Koth, Karkara, Wam and Bombay duck at Bombay and of *Nemipterus japonicus* and *Lactarius lactarius* at Ernakulam were continued. Analysis of biological data of 'Dara' occurring in offshore waters of Bombay, Cambay, Porbunder and Dwaraka were continued to arrive at norms of general pattern of their movements and behaviour during different months. Scale studies of Koth and the significance of the scale rings showed that the annuli are formed during the winter months and the annual lowering of feeding intensity with the environmental changes may be probable cause for the formation of scale annuli. Length-frequency study of 'Koth' indicated further proof for the protracted spawning and prolonged recruitment of the stock. Scales and otoliths of *Pseudosciaena diacanthus* have been found to show growth rings which can be used for age determination and growth studies.

Offshore fishery investigations undertaken by Mr. Naumov, F.A.O., Fisheries Expert at Waltair were completed and studies on fish belonging to 77 families, 119 genera and 167 species were completed. Special studies on other species on similar lines as indicated by Mr. Naumov are being continued.

At Calcutta regular and routine work on the samples collected from the different offshore fishing regions of the Bay of Bengal by West Bengal trawlers were carried out. The study of the biology of *Kurtus indicus, sciaena glaucus* and *Pampus argenteus* were given greater attention.

Marine Fish Farming :

Experimental marine fish farming carried out at Mandapam indicated a definite retardation in the growth of *chanos* and low level in microvegetation production without any supplementary feed or artificial manuring of the ponds. Further studies on the growth of *Chanos* in the second year was continued. Restocking of experimental ponds was carried out for further experiments. Observations on the plankton production in the marine fish ponds in relation to the change in seasons during the year were continued.

Marine Biology :

Planktological investigations were continued at Kandla, Karwar, Mangalore, Kozhikode, Mandapam and Madras. At Calicut, the study of bottom fauna in relation to the Malabar sole fishery and estimation of organic production in the Sea by the 'dark and clear' bottle method was continued. Productivity experiments gave very high values for the inshore water mass during the second and third quarters. The non-colonisation of the bottom mud off Calicut by invertebrates has affected the bottom fishes during the year.

At Mandapam the study of primary production was extended to Palk Bay. The work on organic productivity indicated that the magnitude of organic production in the gulf of Mannar for the year 1960 was higher than the previous year. In addition to routine oxygen measurements in the light and dark conditions, analysis included phosphates, chlorophyll and dry weight of Plankton. Work on the estimation of organic productivity using C 14 has been initiated. In connection with the study of organic production a set of light and dark bottle experiments were conducted off Tuticorin at various depths. The work on the preparation of Key to common copepods was continued.

Hydrological studies on the seasonal variations in the hydrological factors of the inshore and offshore waters with special reference to salinity, pH, temperature, dissolved oxygen and phosphorus content of surface samples etc., were continued. At Cochin diurnal variations in the temperature—salinity characteristics of two stations off Calicut and Cochin at the edge of the continental shelf and beyond the shelf and the main hydrographical features of the Cochin Backwaters were studied.

Algology :

Ecological studies of the intertidal vegetation of Palk Bay and growth rate of algal population were continued. Work was in progress on the algae collected from the Andamans. Processing of agar from the different Indian species was continued in order to secure additional data of economic importance. Taxonomic studies on the Indian agarophytes were continued and a key to the common species were drawn up with a view to their use in a hand book for field work.

(Central Marine Fisheries Research Station, Mandapam).

FISHERY BIOLOGY.

(i) Cross breeding between two species of Caridinean Prawns

Studies on the prawns of Bombay have been in progress for the last two years at the Taraporewala Aquarium. During these investigations, an attempt was made to cross-breed two species of fresh-water prawns, *Caridina weberi* var. *Sumatrensis* and *C. rajadhari*. A notable result was achieved in getting the hybrid larvae which differed from the larvae of the parent species. The hybrid-larvae were reared to adult stage which not only differed from the parent species, but showed some characteristics which are not present in the genus. The hybrids were bred and F_2 generation was also obtained showing segregation of characters. This cross-breeding has been considered as the first successful venture in decapod crustacea, opening a new field in Crustacean Genetics.

(Director of Fisheries, Government of Maharashtra, Bombay.)

INLAND FISHERIES RESEARCH

Fishery Biology

(i) Size-distribution of the Sciaenid, Pseudosciaena coibor in Chilka Lake.

Over 3 years data on the size-distribution of the most important Sciaenid of the Chilka Lake *Pseudosciaena Coibor* collected by the Chilka Investigation Unit of C.I.F.R.S., were pooled and analysed to determine the sizes attained by this fish in different years of its life. Monthly data on fish sizes now available for about 45 months were also used in the delineation of the growth picture of the species. The analysis conducted leads to the inference that a year old fish attains an average length of 260 mm, two year old fish 410 mm., and three year old fish 510 mm., breeding occurring when the South-western monsoon begins in June. While the growth picture in subsequent years is not clear, there are indications to suggest that the four year old fish measures about 625 mm., and the five year old about 730 mm. The growth picture discerned by the study conducted will lead to analysis of data on commercial landings into approximate age and size groups and finally into the relative strength of each year class in different years.

(Central Inland Fisheries Research Station, Barrackpore.)

(ii) Studies on Chinese Carps.

Observations on the experimental consignments of Chinese Carps obtained from Tokyo and Hongkong were continued at the Central Inland Fisheries Sub-Station at Cuttack. The Grass Crap, *Ctenopharyngodon idellus* was found to grow very rapidly in ponds with abundance of submerged weeds, particularly *Hydrilla*. Preliminary observations showed that a pond choked with *Hydrilla* can be cleared of the weeds completely in the course of a month if yearlings Grass Carps (200 to 300 gms. in weight) are introduced at the rate of approximately 150 per acre. In ponds devoid of macrovegetation the growth of Grass Carp was poor in spite of artificial feeding with oil cakes.

The Silver Carp (Hypophthalmichthys molitrix) is a plankton feeder like Catla. Preliminary experiments on growth under comparable conditions indicate that the former grows appreciably faster than Catla. During a period of 16 months the fish has attained a maximum weight of 4.2 kgs. in the Killa Farm, Cuttack.

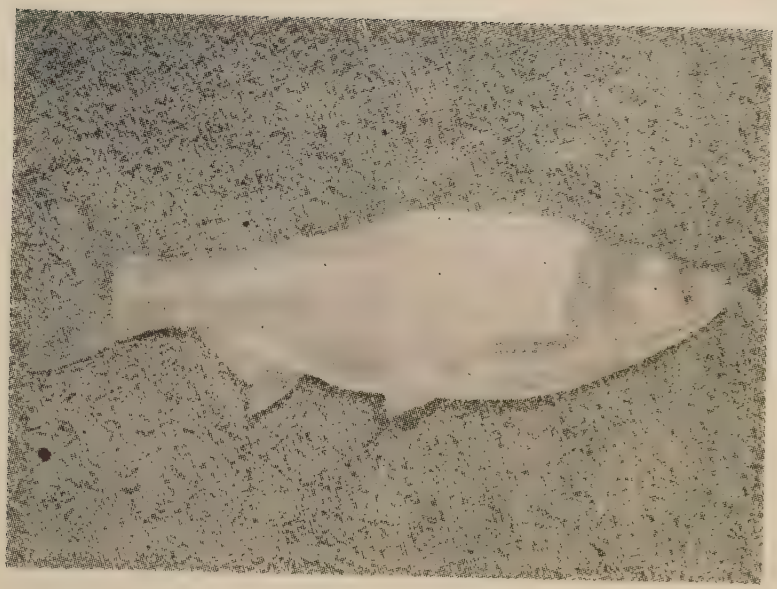
If these fishes attain sexual maturity in the new environment and if they could be successfully bred by pituitary injections, intensive experimentation prior to releasing them for general stocking will be possible.

(Central Inland Fisheries Research Station, Barrackpore)

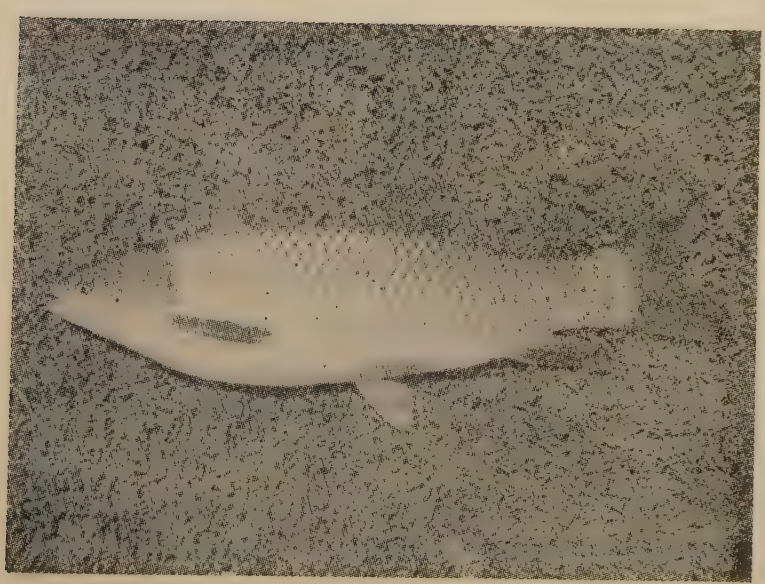
(iii) Hybridisation of Major Carps.

With the success on induced spawning it was possible to produce hybrids by inter-crossing various species of Indian carps. Observations on about a dozen such hybrids are in progress with a view to find out whether any of them will have better cultural qualities as compared to the parents.

The hybrid between Catla and Rohu has grown almost as well as Catla and has a much smaller head than Catla and a deeper body than Rohu. These features appear to be useful but it remains to be seen whether they could be stabilised.



The Chinese Silver Carp—
Hypophthalmichthys molitrix



The Chinese Grass Carp—
Ctenopharyngodon idellus.

Some of the hybrids, interspecific as well as intergeneric have attained sexual maturity when 2 years old and attempts at inducing them to breed by pituitary injections were successful in the case of Rohu—Calbasu hybrid. The spawn so produced are being reared for detailed study.

(Central Inland Fisheries Research Station, Barrackpore)

(iv) Fish Tagging Experiments.

Fish tagging experiments which were carried out on a fairly extensive scale on important species of mullets in the Chilka Lake and on Hilsa in the estuaries of West Bengal have started yielding interesting results with increasing recoveries of tagged fish. The tagged fish recoveries have given an indication of the trend of the movement of these fishes and of their growth rate.

(Central Inland Fisheries Research Station, Barrackpore)

(v) Induced Spawning of Indian Carp.

Large scale production of fish seed by inducing Major carps to breed by administering pituitary hormones was successfully attempted at Cuttack during June—September, 1960. During the season a total number of one crore and 38 lakhs of spawn was produced of which 82 lakhs survived and used for stocking nursery ponds. Nearly half of the above quantity was supplied to the Orissa Fisheries Department for rearing, while the rest were used for rearing in experimental ponds.

All the major carps, Catla, Rohu, Mrigal and Calbasu were successfully and repeatedly induced to breed during the season. Details relating to some of the specimens that spawned are as follows:—

Species	Weight	No. of eggs laid	% of fertilisation
Catla	5·5 kg.	5,50,000	60
Rohu	5·7 kg.	10,00,000	95
Mrigal	4.8 kg.	11,60,000	90

It was clearly demonstrated that with adequate stock of breeders and requisite supply of field equipment such as breeding and hatching hapas etc. production of fish seed on a commercial scale could be achieved by this method.

Of the large number of breeders injected during the season successful results were obtained in 60% of them. By recording relevant details of the pituitary glands used and of the doner fishes attempts were made to standardise the dozes in terms of mg. weight of the gland per kg. weight of the breeder fish. The arbitrary nature of the selection of breeders, the possible differences in the stage of maturity and lack of information about the exact hormone content of the glands injected make any generalisation about the doses at present unwarranted.

Off-spring of Mrigal and Calbasu produced by pituitary hormone injection in 1958, attained maturity in ponds in 1960. These readily responded to injections and breed successfully. The young ones are being reared with a view to find out whether they will show any difference in breeding habits as compared to fish reared from river spawn.

(Central Inland Fisheries Research Station, Barrackpore)

Common Carp—*Cyprinus carpio.*

Gourami—*Osphronemus gourami.*

(vi) **Breeding and propagation of the Common Carp, Cyprinus carpio.**

Observations on the growth and breeding of the Bangkok strain of common Carp conducted at the Cuttack Sub-Station yielded very valuable results. On the recommendation of the Fisheries Research Committee, consignments of fry and fingerlings of *Cyprinus carpio* were supplied to various States and private parties on request. Over 1,15,00,000 spawn and 7,40,000 fry and fingerlings were distributed throughout the country. While the bulk of the supply was to Orissa, States like Tripura, Andhra, Assam, Mysore, Punjab, Madhya Pradesh, Madras and West Bengal have also taken experimental consignment of fry for rearing.

Since the species started breeding in India at Cuttack in February, 1958, experimental breeding has resulted in the production of over 150 lakhs of spawn of which over 106 lakhs were produced during the short period of 2½ months from middle of January to end of March, 1960.

In some of the fish farms in Orissa State where the spawn, fry and fingerlings were supplied, breeder stock of fish have now become available. Breeding was successfully demonstrated in Sambalpur and Barang fish farms, where trained staff have subsequently taken up fish breeding successfully.

Grown under normal conditions the Common Carp attains sexual maturity when only about 5 months old. The males continue to be in milt throughout the year; while the female takes about 3 months to recoup after spawning and be ready to spawn again. Keeping a stock of about 50 female breeders it has been found possible to breed one or other of them almost at any time of the year. However, mid-January to end of March is the period of intensive breeding, while during July-August also quite a number of them could be spawned easily.

Breeding was done in cement cisterns containing tap water or well water and in cloth hapas fixed in ponds. No running water was provided in any case. When spawning larger specimens exceeding 4 kg. in weight, good results can be obtained if large cisterns are used and gentle flow of water provided.

The traditional Dubitsh method (by using aquatic weeds as egg collectors) of spawning have been followed hitherto and only preliminary experiments on the use of "Kakabans" for spawning have been tried. It is now proposed to try the "Kakabans" method of spawning on a large scale during the ensuing season of intensive spawning.

Natural spawning of fish was observed in a few occasions in some of the farm ponds. In all such cases production of fry or fingerlings was very poor. On the other hand, it was demonstrated that if weeds with eggs attached to them are collected and transferred to hapas fixed in the same pond or to prepared nursery ponds for hatching, quite a large number of fry could be obtained.

Growth of the fish has been quite satisfactory during the 3 years period for which the species has been under observation now. The maximum size the original stock has attained now in the Killa Fish Farm is 16 lbs. (7.3 kg.) the average being 10 lbs. (4.6 kg.). The first progeny of the original stock, released in the Barang Fish Farm have been reported to have attained a weight of about 21 lbs. (9.5 kg.) when they were only 28 months old. Advanced fingerlings weighing 80 gms. each stocked in the Killa Channel, were found to have attained an average weight of 840 gms. (maximum 1.4 kg.) in the course of 5 months. Stocking experiments carried out in small ponds at

Killa indicated that during a period of six months the production of Common Carp was more than the combined production of Rohu and Mrigal under similar conditions.

Colour variations are common in the Bangkok strain of Common Carp. Work on selective breeding of these varieties are now in progress.

(Central Inland Fisheries Research Station, Barrackpore)

HYDROBIOLOGY.

(i) Weed Control Investigations.

Eradication of aquatic weeds by the use of free ammonia was undertaken on a field scale in larger ponds at Chaudwar and Kausalyaganga in Orissa. The gas has been found to have lethal action on a variety of submerged, floating and emergent weeds. It has been found possible to use ammonia as a combined weedicide, fertilizer and a lethal agent for unwanted species of fishes and prawns.

Though the gas is lethal to fish, sectional treatment of the infested pond has been to prevent mortality of fish. Nursery ponds cleared of unwanted fish by application of ammonia can be used for spawn rearing, a month after the treatment by which time the plankton position in the water has been found to become normal.

(Central Inland Fisheries Research Station, Barrackpore)

FOREIGN

GENERAL AND DEVELOPMENT

MARINE.

(i) U.S.S.R. Tops Fishing.

The Soviet Union's 1959 fisheries catch totalled 6.8 billion lb. (34,00,000 short tons). This made the Soviet Union the leading fishing country of the world, ahead of either China or Japan in next place and U.S.A. fourth (5.1 billion lb. in 1959). The Soviet target for the end of the Seven Year Plan in 1965 is 10.2 billion lb.

(Fisheries Newsletter, December, 1960—p. 23)

(ii) A Small-boat Tuna Long-Line Fishery.

Small fishing vessels from Gloucester, Mass., have successfully fished subsurface blue-fin tuna (*Thynnus thynnus*) on Stellwagen bank in Massachusetts Bay using long-line gear especially adapted to inshore operations for large tuna. During the shore season between mid-August and late October, boats 35 to 40 feet in length have made catches of approximately 60,000 lbs. per vessel. The Small-Boat Tuna long-line gear used has been tabulated.

(P. C. Wilson—Commercial Fisheries Reveiew—September, 1960—pp. 8—13.)

(iii) Lobster Explorations on Continental Shelf and Slope off North East Coast of the United States.

Commercial quantities of American lobsters (*Homarus americanus*) were found in deep water as a result of explorations conducted by the U.S. Bureau of Commercial Fisheries on the continental shelf and slope off the north eastern

portion of the United States in depths of 50 to 600 fathoms. Two areas were defined by the Bureau's exploratory research vessel Delware in which sufficient number of lobsters were taken to indicate the feasibility of commercial scale exploitation. Standard commercial trawling gear was used at all of 211 stations covered in the investigation.

(E.D. McRae Jr.—Commercial Fisheries Review—September, 1960—pp. 1—7).

(iv) Final Report on the Tariff Simplification Study Issued.

The U.S. Tariff Commission released on November 15, 1960, the final report on its tariff classification study. The report constitutes a recommendation to Congress for revision of the customs laws under which imported articles are classified for tariff purposes.

The study was undertaken by the commission pursuant to Section 101 of the Customs Simplification Act, 1954. It was intended to lead to a proposal for congressional consideration, to simplify and modernize the tariff schedules. The study was not directly concerned with tariff rates.

The Tariff Commission's final report consisted of ten volumes, one of which was Schedule I—Animal and Vegetable Products. An early version of this Volume was issued by the Commission in 1958 and was the subject of public hearings.

(Commercial Fisheries Review—November, 1960—p. 93)

Technology.

(i) Fish-in-Bags Hooks Plus-sales.

A Seattle seafoods packer is now marketing vacuum-packed frozen fish steaks and fillets in triplex, extruded film pouches that are placed in window-type consumer cartons.

Dehydration and oxidation, major distribution problems with frozen fish, are significantly reduced by the new package. The pouch, reportedly, keeps fish sweet and fresh, without loss of colour for at least 4 days after thawing when it is held at 45°F. In addition, the film bag reportedly extends product storage—life by more than two times that of conventionally packaged fish, fits snugly to the product, and remains crystal clear and frost free.

The triple laminate bag is composed of 2—polythelene for heat sealing on the inside and of ½—mil saran—coated mylar for wear on the outside. Mylar gives the package its strength, whereas saran protects the fish from ultraviolet rays and serves as a gas barrier. Each bag of frozen fish is packed in a box that is 6¼ inches in size, with a window for product visibility Bold, green lettering is used on ends of this box to identify its contents. Shipping cases are coded green for halibut, red for salmon, blue for sword fish and orange for other fish.

Steaks are cut 7/8 inches in thickness and vacuum packed 12 ounces or more to each bag under 29 inches of vacuum by a flex-vac unit. This amount of vacuum when used with salmon is modified by the addition of a small quantity of food-grade nitrogen to prevent the loss of oil from the product.

True cod fillets, Alaska King crab meat, and other fillets also are packaged by the same process. Fillets are packed in pouches with an orange back ground for rex sole, light green for petrale sole, and yellow for cod.

Boil-in-bag seafood specialities such as halibut alacking, halibut in cheese sauce, Curried shrimp, and crab Newburg are packaged in 4 ounces to a serving in thermolam poly-Mylar film. These packages are retailed in cartons that contain two servings and carry a full colour photo of the product.

(Commercial Fisheries Abstruct—November, 1960 p. 7).

(ii) **Rapid Objective Freshness Test for Blue-Crab Meat and Observations on Spoilage Characteristics.**

The Picric Acid Turbidity test, reported earlier for use with Shrimp, has been found to be satisfactory with one modification, for use as a rapid, objective freshness test for various commercial styles of blue-crab meat held under different conditions of storage and picked from steamed or boiled crabs. This test permits identification of blue-crab meat of fair or better quality and identification of crab-meat of border line or poorer quality. Data obtained in these studies gave an indication of the spoilage characteristics of the crab.

(C. H. Kurtzman and D. G. Snyder—Commercial Fisheries Review—November, 1960, pp. 12—15.)

(iii) **Nutrition Symposium of National Fisheries Institute.**

Fish meal qualitq:

This is a summary of a 3-year research programme on fish meal quality conducted by Dr. Tom Runnels of the Poultry Department at the University of Delaware.

Experiment 1.

About 100 samples of fish meals were tested for comparative nutritive value by including a limited uniform amount of fish meal protein, in an otherwise complete practical broiler diet. All experimental diets were individually balanced with corn meal, soybean meal, bone meal, fat and methionine to provide 21·5 per cent protein, 0·5 per cent methionine and a calorie-to-protein ratio of 45. The diets were also balanced to contain 1·05 per cent calcium and 0·66 per cent phosphours. Fish meal provided 3 per cent protein or about 14 per cent of the total protein. Two control diets, one containing a particular menhaden fish meal and other an all vegetable protein diet were fed in each series.

Randomly selected day-old white Rock cockerels were allotted to groups and were fed the comparative diets containing the various samples of fish meals from the first day. The groups were housed in battery brooders for 4 weeks at which time chicks were weighed and food consumption was recorded. The groups then were transferred to growing battery cages and were fed the same diets. Gain in weight and food consumed were determined at the end of 7 and 10 weeks. Each group consisted of three pens, each containing 10 birds, for a total of 30 birds.

Results.—In two out of the first five experiments, nearly all groups of chicks fed the diets containing fish meal gained significantly more weight and utilized the feed better than the group fed the vegetable control diet with no fish meal. In other three experiments, only a few such difference were found.

Quality of protein was equal for the commercially processed meals regardless of whether (1) steam or hot air cylindrical dryers were used in processing the meals, (2) meals were made from fresh or spoiled menhaden, or (3) meals were sampled before or after curing in a pile.

Experiment 2.—

About 80 or more samples of commercially prepared meals were screened by the same procedure used previously. Statistical analysis indicated that no results were obtained that are contrary to findings obtained in the previous experiment. Growth data did not correlate (1) with catch data, (2) with proximate analysis of all authentic samples of fish meal, or (3) with the chemical identity of the compounds composing the kjeldahl nitrogen fraction of 69 selected samples of meals.

Conclusion.—For all practical purposes, fish meal of normal commercial production are a reliable source of supplemental animal protein.

(Commercial Fisheries Abstructs—Nov. 1960, p. 11).

TRADE.

World Fish Trade up by 15% in 1959

The world trade in fish increased in volume in 1959 by 15% to reach a total of 7½ million metric tons (live weight) compared with 6½ million tons in 1958. The total comprised the trade of 95 countries representing 85% of the world fish catch.

Norway continued to be the world's leading exporter of fish in 1959, marketing 5,58,000 metric tons of fish (product weight) valued at $ 15,15,69,000. The volume was 28% higher than that of its closest competitor, Japan, but the latter's 1959 exports had a 35% higher value. Japan exported 4,36,100 metric tons of fish valued at $ 20,46,18,150. Norway's exports of fish meal fell from 1,45,700 metric tons to 93,800 tons, and Angola's from 94,000 tons to 51,000. But Peru's fish meal exports rocketed to 2,81,400 tons in 1959, compared with 1,07,500 tons in 1958 and about 55,000 tons in 1957. The Union of South Africa also increased its fish meal exports from 58,000 tons in 1957 and 92,000 tons in 1958 to 1,04,000 tons in 1959. The Chief importers of fish meal were West Germany, 1,57,000 tons and the United States, 1,32,000 tons, compared with 1,06,000 tons the previous year. The United States was again the world's largest importer of fishery products, taking 6,47,000 metric tons in 1959. But U.S.A. also exported 1,02,800 tons of fish products.

World's export of fresh and frozen fish rose from 8,44,900 metric tons valued at $ 26,17,08,000 in 1958 to 8,91,100 tons worth $ 26,83,29,000 in 1959. World trade in dried and salted fish decreased from 5,57,000 metric tons valued at $ 16,71,65,000 in 1957 to 5,16,200 tons valued at $ 15,97,84,000 in 1959.

World trade in canned fish increased from 4,35,000 metric tons in 1957 and 4,84,000 tons in 1958 to 5,09,000 tons valued at $ 34,66,78,000 in 1959. Japan is the leading exporter of canned fish with 1,06,000 metric tons in 1957, 1,37,000 tons in 1958 and 1,46,000 tons in 1959.

(Fisheries Newsletter—December, 1960, p. 15).

SOCIO-ECONOMICS.

Fish Processing Workers at Hamburg get Wage Increase

Negotiations between West German Food Workers' Union and representatives of the Hamburg fish processing industry resulted in a wage increase of DM 0·11 (about 2·6 U.S. cents), or about 5 per cent, per hour, for workers in that industry retroactive to June 1, 1960. The increase would raise the hourly rate for those workers to about 55·4 U.S. cents an hour.

(Commercial Fisheries Review—September, 1960, p. 48).

CONSERVATION AND MANAGEMENT.

(i) **Regulations issued for Marine and Inland Fisheries in Liberia.**

The Liberian Department of Agriculture and Commerce has published the first detailed maritime and inland fishing regulations to go into effect in Liberia. These regulations are as follow:—

(1) Establish mandatory license fees for commercial fishing vessels ranging from $ 150 for trawlers to $ 5 for native canoes, but exempt subsistence fishermen and person under sixteen "who are not required to have license to fish."

(2) Authorizes the Bureau of Fisheries to prohibit fishing gear harmful to fishery resources and particularly prohibits dynamiting.

(3) Authorizes the Bureau of Fisheries to close any fishing zone because of over fishing resulting from use of certain types of fishing gear.

(4) Establishes mesh regulations.

(5) Required monthly reports from commercial fisheries, with respect to area of catch, tonnage, gear used, value of catch, and species of fish caught.

Although enforcement may prove to be a problem, these regulations represent a useful first step toward better management of Liberia's fisheries resources. They should also be helpful in developing, over a period of time, more accurate information on the extensive, but inaccurately charted coastal fisheries resources of the country.

(Commercial Fisheries Reveiew—September, 1960 pp. 57-58).

(ii) **New Cray Fish Regulations in Tasmania.**

Tasmanian Sea Fisheries Regulations have been amended to define the closed season against the taking, trading in, or possession of female crayfish as being from June 1 to October 31 (instead of November 30) annually. The same closed season operates in victorian waters and in commonwealth waters adjacent to Victoria and Tasmania.

Tasmanian regulation 32, which sets 4¼ ins. as the minimum legal size for crayfish, now also provides a size of 4½ ins. when the rostrum is absent.

Part II of the Fourth Schedule now determines the number of pots permitted according to size of boats as follows: Under 20 ft. 12 pots; 20 ft. and under 30 ft., 15; 30 ft. and under 40 ft., 20; 40 ft. and under 50 ft., 25; 50 ft. and under 60 ft., 30; 60 ft. and over, 40. A crayfish boat Penghana is used as a sea-going Patrol vessel.

(Fisheries Newsletter—December, 1960, p. 11).

MARINE FISHERIES RESEARCH

New Method of Control for Common Mussel

A new method for control of the Common mussel, a competitor of oyster, has been developed by the U.S. Bureau of Commercial Fisheries, Milford Biological Laboratory. In preliminary experiments, a 1 per cent solution of Copper sulphate killed 99·3 per cent of the mussels, while an insignificant number of oysters were injured. Further experiments are now in progress, but all observations to date show the same results, i.e. nearly all mussels are

killed by the treatment while the few oysters are injured. The copper sulphate method is much cheaper and more effective than Victoria Blue. The latter, however, is still very useful in combatting other competitors, such as tunicates.

(Commercial Fisheries Review—September 1960 p. 27)

(ii) Albacore Tuna Migration off Pacific Coast Studied

The high seas area off California and Baja California within the latitudes 30°N and 38°N and inshore from 134°W longitude were surveyed by the California Department of Fish and Game research Vessel *N.B. Scofield* in May-June, 1960. The objectives were (1) to explore the offishore area prior to the commercial albacore season in an attempt to intercept and determine the migration route or routes of albacore schools approaching the Pacific coast; (2) to tag and release albacore; and (3) to gather biological and oceanographical data. Most of the 3,000—mile survey track was scouted during daylight hours using surface trolling gear.

The majority (90 per cent) of the fish averaged about 12 pounds each, the rest ranged from 18 to 30 pounds primarily in south eastern portion of the survey area. Stomach of untagged fish showed no evidence of recent heavy feeding.

All of the albacore in suitable condition when hauled abroad were tagged. Experiments designed to test the recovery rate of "spaghetti" tags with that of dort tags were continued. The two types used alternately resulted in a release of 38 "spaghetti" and 36 dort tags. The greatest number of fish tagged at one position was six.

Sea surface temperatures varied from 10.7° to 18.5°C and all albacore were caught within a temperature range 15.3° to 17.9°C. 83% was taken in 15.9° to 17.1°C water. Sea water samples for salinity were collected throughout the survey.

(Commercial Fisheries Review—November, 1960—pp. 2—22)

INLAND FISHERIES RESEARCH

Tilapia Mosambica culture

The story of research on *Tilapia mosambica* is becoming well-known. The 'Malayan' strain is derived from Singapore stock, whence also Thailand, India, Ceylon, Hongkong, Borneo, New Guinea, the Phillippines and Hawaii derived their supplies. In common with many other related species *Tilapia mosambica* has the disadvantage that it breeds too freely under pond conditions, quickly becoming overcrowded. Successful crops depend on the use of mono-sex cultures. The Tropical Fish Culture Research Institute, Malacca, Federation of Malaya imported a closely allied strain, from Zanzibar and these fish were crossed with the Malayan strain. It quickly became obvious that the hybrids were vastly superior to the parents, heterosis being so marked that the hybrids grow twice as fast as their parents. More important still, when a Zanzibar male is crossed with a Malayan female all the hybrids appear to be male, and thus a mono-sex brood is produced without the problem of sexing the fry. Research is being conducted to unravel the reasons for this sex ratio, and at the same time by selection improve the parent stocks. Attempts are also being made to cross the two grass-eaters, *Tilapia Zillii and T. mossambica.*

(G. A. Prowse, Director, Tropical Fish Culture Research Institute, Malacca, 9th session of I.P.F.C. January, 1961)

List of Laboratories in India Dealing with Marine and Freshwater Biology.

1. Department of Fisheries, Maharashtra Government.	(Marine biology & fisheries).
(*a*) Taraporevala Aquarium & Marine Biological Station, Netaji Subhas Bose Road, *Bombay*.	
(*b*) Marine Biological Station *Ratnagiri*.	
2. Department of Zoology, Institute, of Science, *Bombay*.	
3. Mysore State Fisheries Laboratories, Department of Fisheries, Bangalore-3. *Mysore State*.	Fisheries.
4. (*a*) Aquarium and Marine Biological Laboratory, University of Kerala, *Trivandrum*.	(Marine, Biology & Fisheries).
(*b*) Freshwater Biological Station Ayiramthengn *Ochira* P.O., Kerala State.	(Fresh water biology & fisheries).
5. Department of Fisheries, Kerala State . .	(Marine biology & fisheries).
(*a*) Marine Biological Station West Hill *Calicut*.	Do.
(*b*) Estuarine Research Station, Ernakulam .	Estuarine biology and Fisheries.
(*c*) Freshwater Research Station, Thiruvalla .	Freshwater biology & fisheries.
(*d*) Biological Laboratory *Vizhingom* . .	Marine biology and Fisheries.
6. Department of Fisheries, Madras State.	
(*a*) Freshwater Biological Station Bhavanisagar *Via* Coimbatore.	(Freshwater biology & fisheries).
(*b*) Ennore Biological Station Ennore *Via* Madras.	(Marine biology & fisheries).
(*c*) Marine Biological Station Krusadai Island, Ramnad Distt.	
(*d*) Marine Biological Station Tuticorin, S. INDIA.	
7. University Zoological Laboratories, University of Madras, Chepauk, *MADRAS*.	(Marine biology & Fisheries).
8. (*a*) Department of Zoology, Annamalai University, Annamalainagar, S. INDIA.	Marine biology and Fisheries
(*b*) Marine Biological Station Porto Novo	
9. Department of Zoology and Oceanography, University of Andhra, College of Natural Science, Waltair.	
10. Chilka Biological Station, Department of Fisheries, Balugaon (Puri Distt.) *ORISSA*.	
11. Department of Zoology, University of Calcutta, 36, Ballygunge Circular Road, *CALCUTTA*.	
12. Fisheries Research Laboratory, Department of Fisheries, *PATNA* (Bihar).	
13. Uttar Pradesh Fisheries Research Laboratory, Badshahbag, *LUCKNOW* (U.P.).	
14. Department of Zoology, Lucknow University, *LUCKNOW*.	
15. Department of Zoology, Delhi University, *DELHI*.	

16. Zoological Survey of India, 34, Chittaranjan Avenue, *CALCUTTA*-12.

17. Central Inland Fisheries Research Institute, Barrackpore *Via* Calcutta. (Inland Fisheries).

(*a*) C.I.F.R. Sub-Station 28, Cantonment Road, Cuttack-1 (Orissa).

(*b*) C.I.F.R. Sub-Station, 30, Panna Lal Road, Allahabad, U.P.

(*c*) Estuarine Fisheries Research Centre, 47/1 Strand Road, *CALCUTTA*-1.

(*d*) Chilka Fisheries Investigations Unit, Balugaon, Distt. Puri, *ORISSA*.

(*e*) Lacustrine Research Unit Tungabhadra Dam, Hospet, *Mysore*.

(*f*) Estuarine Fisheries Research Centre, Jolasahi, Cuttack, *ORISSA*.

(*g*) Godavari-Krishna River Survey Unit, Rajamundry, *ANDHRA*.

(*h*) Narmada-Tapti River Survey Unit, Hoshangabad, MADHYA PRADESH.

(*i*) Pond Culture Research Unit Joysagar, *ASSAM*.

18. Central Marine Fisheries Research Institute, Marine Fisheries, P.O., Madras State. (Marine fisheries & Marine biology).

(*a*) C.M.F.R. Sub-Station, Botawala Chambers, Phiroze Shah Mehta Road, *BOMBAY*.

(*b*) C.M.F.R. Sub-Station, West Hill P.O. Kozhikode-5. *KERALA*.

(*c*) C.M.F.R. Sub-Station, Ernakulam, *KERALA*.

(*d*) C.M.F. Research Unit, Karwar, *MYSORE STATE*.

(*e*) C.M.F.R. Unit, Mangalore, *MYSORE STATE*.

(*f*) C.M.F.R. Unit, *MADRAS*.

(*g*) C.M.F.R. Unit, Visakhapatnam.

(*h*) C.M.F.R. Unit, 43, Theatre Road, *CALCUTTA*.

(*i*) C.M.F. Research and Survey Centre, Kandla, *GUJERAT*.

(j) C.M.F. Research and Survey Centre, Quilon, *KERALA*.

(*k*) C.M.F. Research and Survey Centre, Vizhingam, *KERALA*.

(*l*) C.M.F. Research Centre, Porto Novo, *MADRAS STATE*.

(ii) Training in Deep Water Fishing

The training in Deep Water Fishing in Inland Waters conducted at Maithon from 15th to 30th October was attended by about 21 officers from various States.

Mr. S. B. Gulbadamov, F.A.O. Expert and his interpreter returned to Calcutta on 31st October, 1960, on completion of the experimental work in the Damodar Valley Corporation reservoir.

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